

IN THE CLAIMS:

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1 1. (Currently amended) An apparatus that provides at least one estimated  
2 effective age of a product during the entire life of the product, comprising:  
  
3 at least one sensor equipped on the product that provides data about  
4 an environmental condition;  
  
5 a device equipped on the product that uses said data to calculate an  
6 age acceleration factor for said product for at least one of said sensors;  
  
7 at least one accumulator equipped on the product that provides the  
8 estimated effective age for said product, based upon said age acceleration  
9 factor; and  
  
10 a display equipped on the product capable of presenting said  
11 estimated effective age to a user of said product.

1 2. (Original) The apparatus of claim 1, wherein said sensor includes an analog  
2 to digital conversion function, and wherein said device that uses said data to  
3 calculate an age acceleration factor is a digital processor.

1 3. (Original) The apparatus of claim 2, wherein said digital processor is  
2 programmed to compute an Arrhenius estimate of said age acceleration.

1 4. (Original) The apparatus of claim 2, wherein said digital processor is  
2 programmed to compute a Coffin-Manson estimate of age acceleration.

1 5. (cancelled) The apparatus of claim 2, wherein said digital processor is  
2 programmed to compute a Hallberg-Peck estimate of age acceleration.

1 6. (Original) The apparatus of claim 2, wherein said accumulator is at least  
2 partially implemented in nonvolatile storage.

1 7. (Original) The apparatus of claim 6, wherein said nonvolatile storage is a  
2 ferroelectric memory.

1 8. (Original) The apparatus of claim 6, wherein said nonvolatile storage is a  
2 flash memory.

1 9. (Original) The apparatus of claim 6, wherein said nonvolatile storage is a  
2 hard disk.

1 10. (Original) The apparatus of claim 6, wherein said nonvolatile storage is a  
2 volatile memory element, with continuity of power provided by a battery.

1 11. (currently amended) The apparatus of claim 1, wherein said sensor produces  
2 an analog voltage output, said analog voltage output varying substantially  
3 linearly responsive to a change in temperature, wherein said voltage output is  
4 said data.

1 12. (currently amended) The apparatus of claim 11, wherein said device that uses  
2 said data to calculate an age acceleration factor for said product is a VCO,  
3 said VCO producing a VCO output signal having a frequency that varies  
4 substantially exponentially responsive to a linear voltage change on an input  
5 of the VCO.

1 13. (currently amended) The apparatus of claim 12, wherein said accumulator is  
2 a counter; said counter being implemented, at least in part, in a nonvolatile or  
3 effectively nonvolatile technology, and wherein said counter is clocked by the  
4 VCO output signal.

1 14. (Original) The apparatus of claim 13, wherein said display is electrically  
2 coupled to selected bits of said counter.

1 15. (Currently amended) A method for producing one or more estimates of  
2 effective age of a product, during the entire life of the product, comprising  
3 the steps of:

4 sensing, using a sensor equipped on the product one or more  
5 environmental conditions;

6 computing, using a computer equipped on the product, an age  
7 acceleration factor for each of the environmental conditions sensed, using a  
8 model that relates the environmental condition to the age acceleration factor;

Q' 9 computing, using the computer equipped on the product, effective age  
10 values, using said acceleration factors;

11 storing, using a storage equipped on the product, said effective age  
12 values into nonvolatile storage; and

13 displaying, using a display equipped on the product, said effective  
14 age values to a user of said product on a display.

1 16. (cancelled) The method of claim 15, wherein the step of computing an age  
2 acceleration factor comprises the use of the Arrhenius equation, the Hallberg-  
3 Peck equation, or the Coffin-Manson equation.

1 17. (cancelled) The method of claim 15, wherein the step of computing effective  
2 age values further comprises the steps of:

3 time integrating the age acceleration factor for each of the  
4 environmental conditions sensed, resulting in an effective age for the product  
5 according to each said model;

6 computing a normalized effective age for some or all of the effective  
7 ages by dividing the instant effective age by a wall clock age;

8 computing an effective life used value for some or all of the effective  
9 ages by dividing the instant effective age by a predetermined estimate of life  
10 of the product; and

11 computing an effective life remaining value for some or all of the  
12 effective ages by subtracting said effective life used value from "1".

1 18. (Original) The method of claim 15, wherein the step of displaying said  
2 effective age values further comprises the steps of:

3 determining if any of said values are outside of predetermined ranges;  
4 and

5 alerting the user if any of said values are outside of predetermined  
6 ranges by lighting a light, sounding an audible alarm, or presenting said  
7 values on said display.

1 19. (New) An apparatus that provides at least one estimated effective age of a  
2 product comprising:

3 at least one sensor that provides data about an environmental  
4 condition;

5 a device that uses said data to calculate an age acceleration factor for  
6 said product for at least one of said sensors;

7 at least one accumulator that provides the estimated effective age for

8 said product, based upon said age acceleration factor; and

9 a display capable of presenting said estimated effective age to a user  
10 of said product;

11 wherein the at least one sensor includes an analog to digital conversion  
12 function, and wherein said device that uses said data to calculate an age  
13 acceleration factor is a digital processor wherein said digital processor is  
14 programmed to compute a Hallberg-Peck estimate of age acceleration.

Q' 1 20. (new) A method for producing one or more estimates of effective age of a  
2 product, comprising the steps of:  
3 sensing one or more environmental conditions;  
4 computing an age acceleration factor for each of the environmental  
5 conditions sensed, using a model that relates the environmental condition to  
6 the age acceleration factor;  
7 computing effective age values, using said acceleration factors;  
8 storing said effective age values into nonvolatile storage; and  
9 displaying said effective age values to a user of said product on a  
10 display;  
11 wherein the step of computing an age acceleration factor comprises the use of  
12 the Arrhenius equation, the Hallberg-Peck equation, or the Coffin-Manson  
13 equation.

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- 1           21. (new) A method for producing one or more estimates of effective age of a  
2           product, comprising the steps of:
- 3                   sensing one or more environmental conditions;
- 4                   computing an age acceleration factor for each of the environmental  
5           conditions sensed, using a model that relates the environmental condition to  
6           the age acceleration factor;
- 7                   computing effective age values, using said acceleration factors;
- 8                   storing said effective age values into nonvolatile storage; and
- 9                   displaying said effective age values to a user of said product on a  
10          display;
- 11          wherein the step of computing effective age values further comprises the  
12          steps of:
- 13                   time integrating the age acceleration factor for each of the  
14          environmental conditions sensed, resulting in an effective age for the product  
15          according to each said model;
- 16                   computing a normalized effective age for some or all of the effective  
17          ages by dividing the instant effective age by a wall clock age;
- 18                   computing an effective life used value for some or all of the effective  
19          ages by dividing the instant effective age by a predetermined estimate of life  
20          of the product; and
- 21                   computing an effective life remaining value for some or all of the  
22          effective ages by subtracting said effective life used value from "1".
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